Trapping Pollen From Honey Bee Colonies

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Summary

Pollen trapping is dependent on the use of a screen or perforated metal grid of about 5-mesh per inch through which the pollen-collecting field bees are forced to enter the colony. This grid is used with a pellet collection container that is covered by 7- or 8-mesh screen to prevent bee entry. This basic principle is common to all pollen traps.

A double-layer grid with the layers separated by 3/16- to 1/4-inch and the openings offset is efficient. The size, shape, and arrangement of the parts; the location of the trap on the colony; the method of installation; and other factors can be varied to suit individual preferences and prevailing circumstances.

Pollen should be trapped only from strong, disease-free colonies in bee-tight hives. Trapping should be done only during pollen flows of one-quarter pound per day minimum, and traps or grids should be removed at other times. Pollen should be removed from the trap often (daily during heavy pollen flows) and cared for properly. During major nectar flows, pollen trapping is unprofitable, and the grid slows down active flight, which reduces honey production.

Introduction

Traps for collecting pollen pellets from legs of honey bees have been designed to trap pollen reserves. These traps vary greatly in size, appearance, and method of installation on the hive. Each has some feature that makes it particularly adaptable for a specific purpose. All traps, however, have two basic elements: (1) a grid through which pollen-carrying bees must crawl to separate the pollen pellets from the bees' legs, and (2) a container to store these pellets.

Incoming pollen can be sampled for studies of foraging activities of bees and for identifying and classifying pollen sources at a given loca-

tion. Stored pollen is a basic ingredient of a pollen supplement for feeding bees. It stimulates brood rearing in early spring when comb-stored pollen is unavailable or the supply inadequate.

Pollen traps, called "pollen guards," were first used by Farrar (3)[1] to prevent bees from bringing pollen into the hive. Todd and Bishop (*18*) improved these guards by changing the grid from perforated metal to 5-mesh hardware cloth. They used the resulting trap to measure the pollen income to hives and the seasonal distribution of pollen in four California locations. Schaefer and Farrar (*14*) described a trap placed at the base of the hive on a raised bottom board so that the normal hive entrance could be used. This trap was slightly modified by Langwell (*8*) and Killion (*7*), but the grids became plugged with dead bees and drones, which made cleaning difficult and restricted ventilation in the hive.

For pollen identification studies, Nye (*11*) constructed a trap that fit underneath the hive and had an opening on the side for removing the pollen tray. The inclined grid could also be removed from the side for cleaning. Smith (*15*) and Smith and Adie (*16*) describe the Ontario Agricultural College's (OAC) trap that fits on a bottom board that has been reversed front to rear. The grid is large and horizontally positioned, and the pollen-collecting tray is removed from the back of the hive. The new hive entrance is in the same position as the bottom board entrance had been and is readily used by the bees. Jaycox (*5*) improved this design. Durante (*1*) produced a trap similar to the OAC's trap. The serious objection to this type of trap is the amount of debris accumulated in the collected pollen.

Stewart and Shimanuki (*17*) used a trap that was inserted in the front entrance for obtaining small samples of pollen in a short time. Erickson, Whitefoot, and Kissinger (*2*) describe a small trap that was installed in an auger-hole entrance to obtain small samples of bees and pollen quickly at desired time intervals.

A pollen trap with eight trays and an electrical device to change the trays periodically is described by Rashad (*12*). Root (*13*) patented a device that could be used as a pollen trap or entrance restricting device or both, by using a manual selector on the outside of the hive.

Lavie and Fresnaye (*9*), Makar (*10*), and Harp (*4*) designed pollen traps that were installed against the front of the hive above the brood chambers. This reduced the amount of trash in the collected pollen but made colony manipulations more difficult. Removal of the pollen tray from the front of the trap also caused some temporary disorientation and irritation of the bees. Kauffeld (*6*) designed a trap that mounted

[1]Italic numbers in parentheses refer to Literature Cited, p. 11.

against the front of the hive between two brood chambers and contained a trash grid and tray in addition to those used for collecting pollen. The trash and pollen trays were removed from the side of the trap to prevent disturbance to the bees, and colony manipulations could be carried on without removal of the trap.

Basic Principles of Design

Pollen traps vary greatly in design and positioning on the hive. *All make use of one basic principle*—a grid to remove the pollen pellets from the bees and a box or tray to collect them. Pollen-collecting field bees are forced to enter the hive through an opening screened with 5-mesh hardware cloth or 5/16-inch diameter perforated sheet material. When passing through this grid, most of the pollen pellets are dislodged from the hindlegs of the returning bees and fall into a tray covered by screen (7- or 8-mesh) that allows the pollen pellets to pass but not the bees. The size of the hole in the grid is the crucial factor. The number of holes in the grid must not restrict normal flight activity at the entrance.

Moisture in the collected pollen may be a serious problem during inclement weather and in areas where humidity is high. The trap should be weatherproof and carefully installed to keep out moisture. Making the tray or collection part of the trap of wood will eliminate condensation, and using copper screen on the bottom of the pollen-collecting container will help to prevent mold in the collected pollen.

The design and location of the pollen trap on the hive may be varied to meet individual needs and prevailing climatic conditions. Ease of installation, ease of colony manipulation, minimum colony disturbance, protection from moisture, cleanliness of collected pollen, and size of collecting tray should receive careful consideration in the design.

A double screen grid is much more efficient than a single screen. When a double screen is used, separate the layers by 3/16- to 1/4-inch and offset the openings. Hardware cloth is generally used for the grid material because it is more economical and more readily available than perforated sheet material. To use the pollen trap effectively, the bees must be forced to enter the hive through the grid. Solid, bee-tight hive equipment is necessary because any secondary openings will be eagerly sought by bees to avoid passing through the pollen trap grid.

Two pollen trap designs are described. Both designs use the same principle of removing pollen from the bees but differ greatly in all other features and in method of mounting on the hive. Many other types and designs of traps are described in the referenced literature.

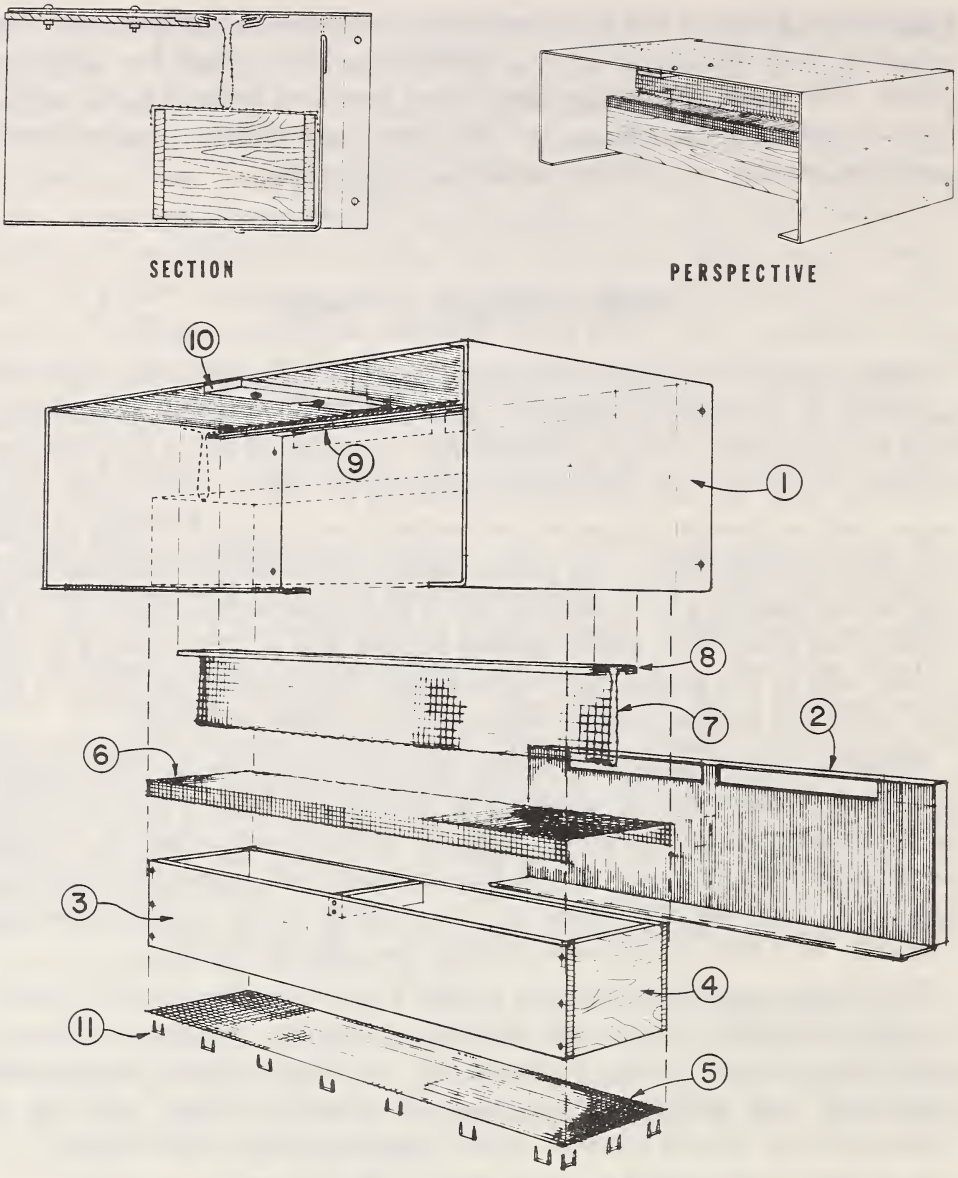

FIGURE 1.—Galvanized steel sheet pollen trap: (1)Trap body—Galvanized steel sheet, 26 gage, 28¼ by 8 inches, formed as shown. (2)Trap back—Galvanized steel sheet, 26 gage, 17¼ by 7 inches, formed as shown and spot-welded into trap body. (3)Pollen tray sides—Wood, 16$^{3}/_{16}$ by 2½ by ¼ inch, two required. (4)Pollen tray ends—Wood, 3¼ by 2½ by ¼ inch, two required. (5)Pollen tray bottom—Copper screen, 16⅜ by 3¾ inches, soldered along edges for rigidity and finish. (6)Pollen tray cover—Hardware cloth, 7- or 8-mesh, 16¼ by 6 inches, formed as shown to fit pollen tray. (7)Grid—Hardware cloth, 5-mesh, 16¼ by 5 inches, formed as shown to provide double grid. (8)Grid edge strips—Galvanized steel sheet, 16¼ by 1 inch, formed as shown to finish grid edges, two required. (9)Grid hanger—Galvanized steel sheet, 16¼ by 1½ inches, formed as shown and spot-welded to trap body. (10)Grid latch—Plexiglass, 4½ by 1½ inches, formed as shown and bolted into place. Other material may be used. (11)Staples to fasten bottom screen to pollen tray.

Galvanized steel sheet pollen trap

The trap shown in figure 1 is made of galvanized steel sheet. Assembly details are given on the line drawing, and width dimensions can be changed to fit the hive. The double screen grid is installed so that it can be removed from the trap. When the grid is fabricated, the ends and the top are left open to remove the dead bees easily. The pollen tray is wood with a screened bottom. The top of the tray slopes downward slightly from the front to rear to insure a tight fit of the hardware cloth cover against the grid.

A special hive body is needed with this trap. Where the trap will attach, a saw kerf is cut horizontally across the front of the hive body 1-inch down from the top. A ½-inch entrance slot 14 inches long is centered in the body and lies immediately below the saw kerf (fig. 2). The top of the trap is inserted into the saw kerf during installation on the special rim to provide a weatherproof connection and aline the entrance slots of the trap and hive body. Two screws are used on the sides of the body to hold the trap in position. The trap installed on a colony appears in figure 3. For installation, the body with the trap is substituted for one of the brood chamber bodies on the colony. The colony with the trap in place can then be worked normally with no

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FIGURE 2.—Special hive body used with galvanized steel sheet pollen trap.

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FIGURE 3.—Galvanized steel sheet pollen trap installed on a colony.

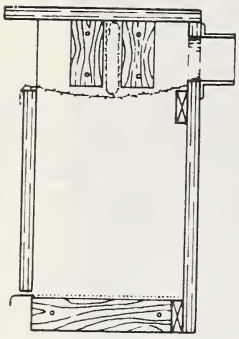
disturbance to the colony other than changing the location of the entrance when the bodies are rotated.

When the trap is installed on the colony, the screen grid should be removed for at least 2 days to permit the bees to become accustomed to entering the hive through the trap. After this orientation period, the grid may be inserted and removed as desired. The trap without the grid may be left on the hive for the entire season without adverse effect. The grid should be installed only when trapping pollen. Additional entrances may be desirable during heavy honey flows.

Auger-hole pollen trap

The trap shown in figure 4, made of wood, is simple in design. The trap is made for hives with 1⅛-inch auger-hole entrances. Pollen is collected in the body of the trap making a separate tray unnecessary. The size of the trap should hold at least 1 day's collection when the pollen flow is at a peak. This amount will vary depending on locale and can be determined by experience. The dimensions given for the line drawing provide sufficient volume in most instances.

A trap with the front and cover removed is shown in figure 5. Bees enter the hive from the trap through a piece of 1⅛-inch diameter tubing



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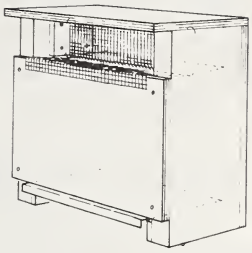

PERSPECTIVE

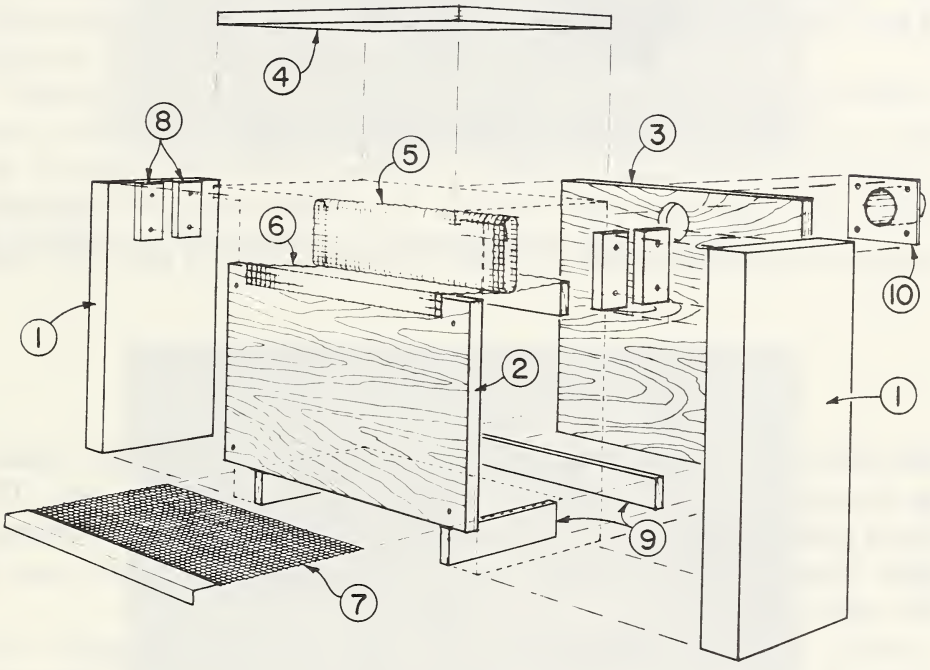

FIGURE 4.—Auger-hole pollen trap: (1)Trap sides—Wood, 3¼ by 7 by ¾ inch, two required. (2)Trap front—Fir plywood, 8 by 4⅝ by ⅜ inch, exterior grade. (3)Trap back—Fir plywood, 8 by 7 by ⅜ inch, exterior grade. (4)Trap cover—Fir plywood, 8 by 4½ by ⅜ inch, exterior grade. (5)Grid—Hardware cloth, 5-mesh, 6⅜ by 3½ inches, formed as shown. (6)Pollen collecting container cover—Hardware cloth, 7- or 8-mesh, 6⅜ by 4½ inches, formed as shown. (7)Pollen collecting container bottom—Copper screen, 4 by 6⅜ inches. A galvanized steel sheet strip is soldered to one edge as shown to provide stiffness and ease of removal. (8)Grid supports —Wood, 1½ by ¾ by ¼ inch, four required. (9)Pollen collecting container cover and bottom supports. Wood, 6½ by ¾ by ¼ inch, two required, and 3¼ by ¾ by ¼ inch, two required. (10)Entrance and mounting tube—1⅛-inch diameter copper tubing ¾-inch long soldered to galvanized steel sheet 2 by 2 inches and nailed over 1-inch auger hole in trap's back.

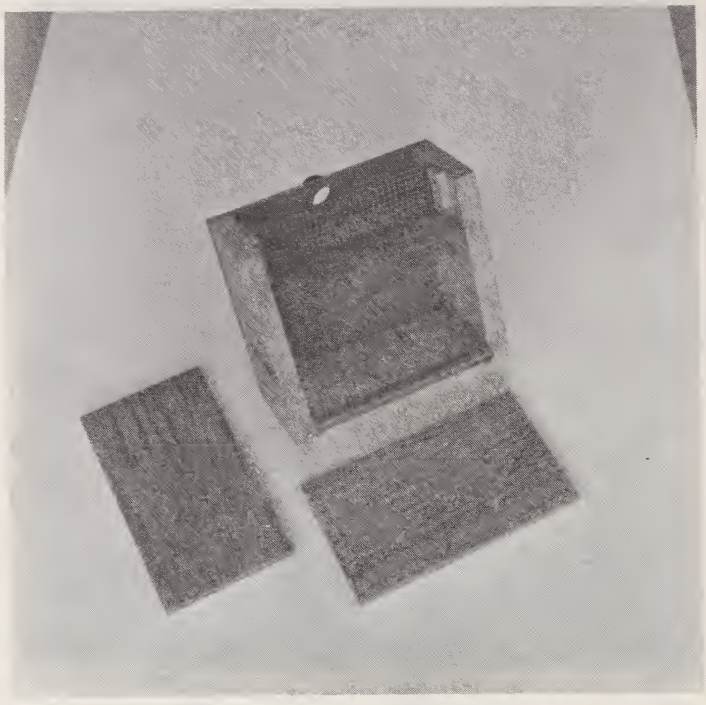

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FIGURE 5.—Auger-hole trap with front and cover removed to show grid and screens.

that also serves as the mounting for the trap on the hive body. Mounting is accomplished by inserting the tubing into the entrance hole. The screen grid can be removed to clean or to allow the bees unrestricted flight. Providing an orientation period is not necessary for the use of this auger-hole trap.

Before the pollen-collection period, the auger-hole entrances are opened so that the bees become accustomed to using them. When the traps are installed, all entrances except those with traps are turned to the back of the colony or closed with corks or bottle caps. This includes the bottom entrance as well as any auger holes without traps. The traps are installed only during pollen flows of ¼ pound per day or more and are removed when the pollen flow dwindles or when a nectar flow of 5 pounds per day or more is in progress.

This trap is removed from the colony to empty the collected pollen. Pollen is emptied from the trap by removing the bottom screen. More than one trap may be used on a colony; however, pollen traps should be removed for colony manipulations and then replaced. A hive with one trap installed is shown in figure 6.

Care of Trapped Pollen

Freshly trapped pollen is perishable and must receive special attention to prevent loss. It may be dried, frozen, or mixed with other material and stored.

When the pollen is dried, spread it on a flat porous surface at a depth of about one-half inch in an enclosed, ventilated room and allow it to air dry. A greenhouse is an ideal place to air-dry pollen. More rapid drying can be accomplished in ovens where a low temperature, 100° F maximum, is maintained and a vent provided for the moisture-laden air to escape. Dry pollen to the point that pellets will not adhere to each other when squeezed. Dried pollen can be placed in airtight glass or metal containers and stored in a cool, dry place.

Fresh pollen can be placed in paper bags and stored in a deep freeze below freezing temperatures. Pollen may be kept frozen until it can be dried or until used if freezer space is available.

Blending fresh pollen with expeller-type soybean flour is possible in equal parts by volume; store this mixture in sealed containers in a cool, dry location. When this practice is followed, care should be taken to pulverize the pollen pellets and soybean flour and blend the mixture thoroughly as described by Whitefoot and Detroy (*19*).

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FIGURE 6.—Auger-hole trap installed on a colony.

Pollen supplement mixing and feeding

The formula for the pollen supplement cake consists of one part dry matter (1 part pollen and 3 parts expeller or screw press processed soybean flour) and two parts sugar sirup (2 parts sugar and 1 part water) by weight. Do not use soybean meal because it is too coarse for the bees to eat. When yeasts (such as brewers' yeast) are used instead of soybean flour, use 6 or 7 parts sugar to 1 part water.

For pollen supplement using soybean flour:
- 1 pound pollen
- 3 pounds soybean flour
- 5⅓ pounds sugar
- 2⅔ pounds water

Yield: 12 pounds pollen supplement

For pollen supplement using yeasts:
- 1 pound pollen
- 3 pounds brewers' yeast
- 7 pounds sugar
- 1 pound water

Yield: 12 pounds pollen supplement

Dry pollen softens readily in water but not in sugar sirup; therefore, the pollen should be added to the water before dissolving the sugar. The 60 pounds of pollen supplement to feed 40 colonies can be mixed in a medium-size tub by adding 5 pounds of pollen to 14 pounds of hot water. Then, stir in 26 pounds of sugar until dissolved. Finally, add 15 pounds of soybean flour and mix thoroughly. When yeasts are used, cut back the water in this mix by 9 pounds and increase the sugar by 9 pounds.

A feeding for one colony (approximately 1½ pounds of supplement) is placed inside a folded sheet of wax paper. The wax paper prevents loss of moisture. When feeding pollen supplement, the hive cover and the inner cover are removed, the bees are smoked down from the top of the frames, and the cake is placed directly over the center of the cluster with the wax paper left on top. The inner cover is replaced in an inverted position to provide space for the cake. This feeding should last 10 to 14 days. Add a new feeding before the previous cake is entirely consumed.

When trapped pollen is not available, soybean flour or brewers' yeast can be mixed with the sirup and fed in the same manner, provided the bees are able to collect some pollen from the field.

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